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ACTIVATED SLUDGE IN SEWAGE TREATMENT

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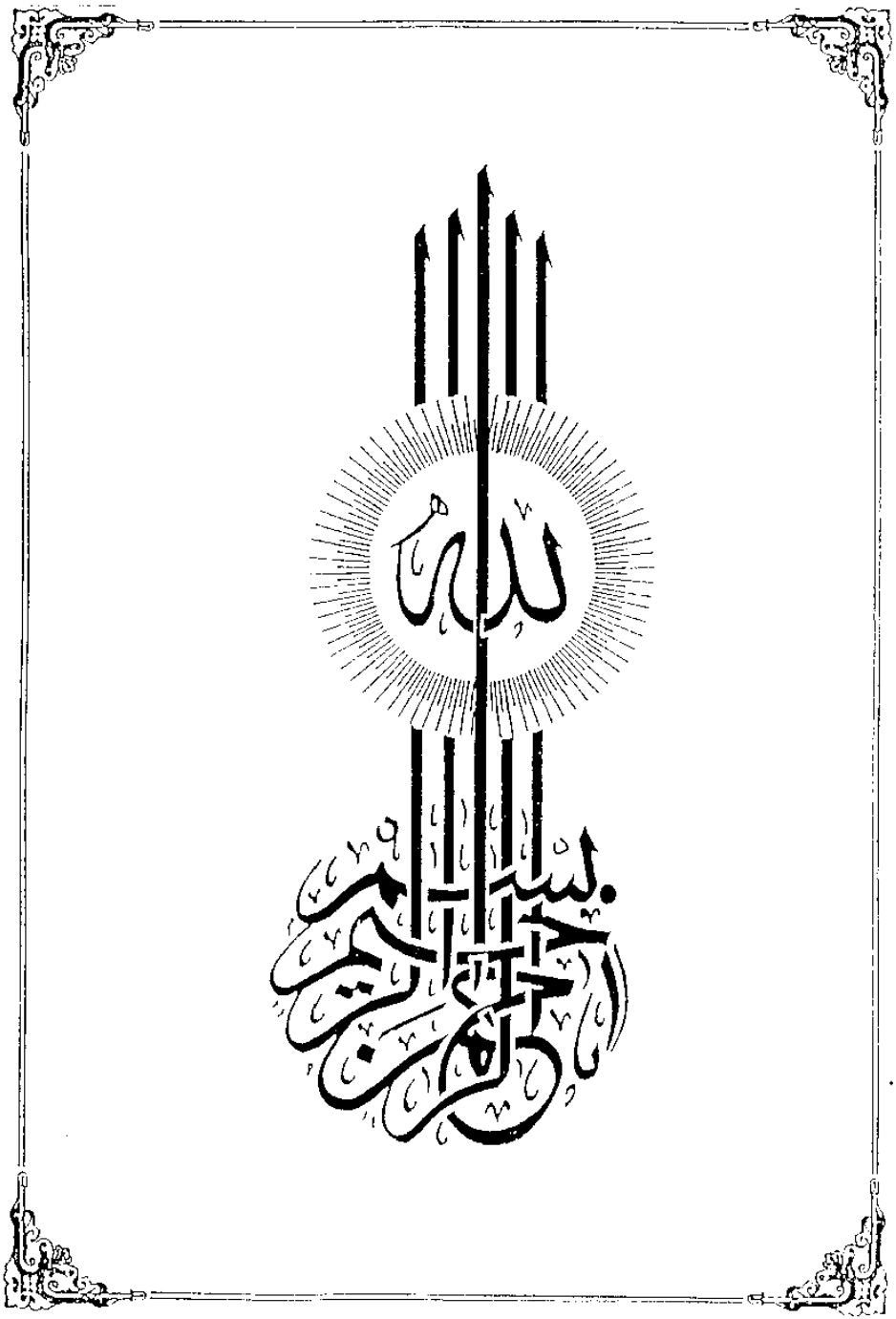

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FOR
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(SANITARY ENGINEERY)

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THIS THESIS IS SUBMITTED TO AIN SHAMS UNIVERSITY FOR THE Ph.D. DEGREE IN CIVIL ENGINEERING (SANITARY ENGINEERING).

THE WORK INCLUDED IN THIS THESIS WAS CARRIED OUT BY THE AUTHOR IN THE PUBLIC WORKS DEPARTMENT, FACULTY OF ENGINEERING , AIN SHAMS UNIVERSITY , FROM 1989 TO NOVEMBER 1996.

NO PART OF THIS THESIS HAS BEEN SUBMITTED FOR A DEGREE OR A QUALIFICATION AT ANY OTHER UNIVERSITY OR INSTITUTION.

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ABSTRACT

Activated sludge process is considered one of most popular methods used for treatment of wastewater. Most of the previous works did not focused on the physical conditioning of the activated sludge, returned to the aeration tank as a feasible method for the improvement the performance of the activated sludge process.The present work aimed to study the effect of applying an external mixing to break up the big clumps and colonies of microorganisms, contained in activated sludge into infinite number of small flocs and active bacterial cells. These broken flocs, when returned to the aeration tank will have a very large surface area this will lead to minimize diffusion resistance of cells and maximize the substrate utilization rate and oxygen transfer rate of the flocs, and consequently improve the performance of the activated sludge process.

The experimental work has been carried out on a laboratory bench scale, continuous flow activated sludge model. A synthetic feed substrate was used, and activated sludge seed from Zenein treatment plant was utilized. The work was performed under various intensity of mixing, aeration detention time and organic loading. The results showed that by increasing the intensity of external mixing of returned sludge results in increase of DO, OUR, Oxygen transfer rate, substrate utilization rate, BOD and COD removal efficiencies and in decrease of effluent VSS and wastage sludge. The optimum energy input corresponding to 92 % and 91 % BOD and COD removal efficiency was 9 Watt. sec applied for one minute at a minimum aeration time of 2 hr. Data obtained demonstrate that the proposed technique can reduce the capacity of aeration tank to about 25 - 30 % of the conventional systems.

Key Words :
Biological Treatment, Activated Sludge Modification, Returned Sludge Mixing, Floc Conditioning, Oxygen Uptake, Substrate Utilization, Mixed Liquor, BOD Removal.

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